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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/672,889	09/26/2003	James J. Snyder	033806-010	9565

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EXAMINER	
LEE, HWA S	
ART UNIT	PAPER NUMBER
2877	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	01/17/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/672,889	SNYDER ET AL.	
	Examiner	Art Unit	
	Andrew Hwa S. Lee	2877	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *14 December 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-64* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *20-23,59 and 60* is/are allowed.

6)☒ Claim(s) *1-19,24-58,61-64* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

1. Claim 62 is objected to because of the following informalities: Claim 62 is recited to be an *apparatus* claim that depends on claim 24, where claim 24 is a *method* claim. Appropriate correction is required.

Claim Rejections - 35 USC § 101

1. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Claims 24-30, 32-34 and 62 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

The claims are directed to a judicial exception, an abstract idea; as such, pursuant to the Interim Guidelines on Patent Eligible Subject Matter (MPEP 2106)), the claims must have either physical transformation and/or a useful, concrete and tangible result. The claims fail to include transformation from one physical state to another. Although, the claims appear useful and concrete, a tangible result is not claimed. Merely determining the wavelength of the input light is not sufficient to constitute a tangible result, since the outcome of the determining step has not been used in a disclosed practical application (e.g. adjusting the wavelength of a laser) nor made available in such a manner (e.g. displaying the results on a computer monitor) that its usefulness in a disclosed practical application can be realized. As such, the subject matter of the claims is not patent eligible.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

3. **Claims 1-19, 24-43, and 61-63** are rejected under 35 U.S.C. 103(a) as being unpatentable over Leuchs et al (US 5,172,185) in view of Kaufman et al (US 3,493,288) and Kachanov (US 5,543,916).

4. With regards to **claims 1 and 35**, Leuchs et al. (Leuchs hereinafter) show a device for determining the wavelength of laser light in Figure 2 comprising:

an optical device having an input port (e.g. entrance to fibers 3 and 4) and two output ports (e.g. 3a, 4a), the optical device defining first and second optical paths (3 and

4) which operate to direct light from the input port to the first and second output ports, respectively, wherein the two output ports are located in a common plane normal to the direction of propagation of the central light rays emitted therefrom and are separated by a separation distance such that light exiting the optical device through the two output ports forms, at an observation plane disposed at a second distance from the two output ports, a fringe pattern whose configuration at the observation plane is a function of the wavelength of the input light beam;

a photo detector (e.g. 8a and 8b) adapted to generate one or more detection signals in response to said fringe pattern; and

a processor (13) implementing a process for analyzing said one or more detection signals to thereby control the wavelength of the input light beam.

Although the embodiment of Figure 2 appears to show that the physical path 4' is longer than path 3' since the exit end of path 4' is further away than the exit end of 3' from their respective entry ends, Leuchs does not clearly show or state that the first and second optical paths have a physical pathlength difference. However, if the pathlength of 4' is identical to 3', one of ordinary skill in the art at the time of the invention would have made the physical pathlength of 4' to be different from 3' for the following reason:

Leuchs suggests that having a pathlength (phase) difference between the two is desired in order to make it easier to detect interference (column 3, lines 17 and 18), and Leuchs shows two examples how to achieve this as shown in Figures 3 and 4. Leuchs however does not show an example by making the physical length of one path longer of than the other path.

Kaufman et al (Kaufman hereinafter) show an interferometer where a phase between the beams in introduced by making the beams travel a different path length. The input and output ports are located in a common plane normal to the direction of propagation of the central light rays Furthermore, Official Notice is given that it is well known in interferometry to introduce a pathlength difference by making one path physically longer than the other. In the case where the interferometer is made from optical fibers or waveguides, bends are well known for providing longer optical pathlengths while the physical length from end to end is compact. In the case where the interferometer is made from bulk optics, it is well known to use mirrors to function similarly to optical fiber bends. In Kaufman's interferometer, one can observe that the size of the interferometer is dictated by the shortest light pipe 13 and not the longest.

Therefore, at the time of the invention, one of ordinary skill in the art would have modified the interferometer of Leuchs so that the physical pathlength of 4' is different from 3' in order to have a more compact interferometer as shown by Kaufman.

Leuchs also only shows two photodetectors and suggests more photodetectors (column 1, line 62) but does not expressly show a CCD and does not expressly state that the wavelength is calculate although suggesting the wavelength can be calculated.

Kachanov shows an interferometer for determining wavelength wherein the interferometer uses two point sources of light similar to Leuchs' fiber ends to create an interference pattern. Kachanov further shows CCD detector and a more complex processor than Leuchs' comparator by using a computer (140) to determine the wavelength.

At the time of the invention, one of ordinary skill in the art would have modified Leuchs with Kachanov's CCD detector and computer in order to obtain more information regarding the wavelength of the light since a CCD can obtain the full range of the interference fringes and the computer can do the perform the calculations automatically from the signals obtained by the CCD.

With regards to **claims 2-4 and 36-41**, Kachanov shows the determining of fringe position in column 11, and obtaining the average of measurements is well known in order to obtain a more accurate measurement

With regards to **claims 5 and 9**, Leuchs shows in figures 2, 4, the system integrated on a substrate comprising a beamsplitter 18, a phase delay (figs. 3 and 4), and output ports 3a and 4a. Leuchs gives a few examples of the substrate material such as glass or lithium niobate, but does not expressly state that it is SiO_2 on a silicon substrate. Official Notice is taken that SiO_2 on a

silicon substrate is well known and at the time of the invention, one of ordinary skill in the art would have used SiO_2 on a silicon substrate for its optical properties and thermal stability.

With regards to **claims 6-8, 42, and 43**, both Leuchs and Kachanov shows temperature control. Also, Official Notice is taken that heat sinks and temperature controllers in thermal communication with optical device is well known in order cool or heat optical elements for control or stability and it would have been obvious to one of ordinary skill in the art to use a temperature controller with any element that generates heat such as the laser or computer to cool the laser or computer.

With regards to **claims 10-15**, one of ordinary skill in the art would have optimized for the proper working range of knowing the relationship of the fringe spacing to the wavelength, pathlength difference, point source distance, and the distance to the observation plane as is known by the teaching of Young (Young disclosed by Applicant's disclosure).

With regards to **claim 16**, Leuchs shows a fiber optic coupler arrangement having output fibers which provide a prescribed optical phase delay (Fig 3).

With regards to **claim 17**, Kachanov shows the determining of the phase difference between two points in the fringe pattern from said detection signals to determine the wavelength.

With regards to **claims 18 and 19**, obtaining the average of measurements is well known in order to obtain a more accurate measurement.

With regards to **claims 61 and 63**, Leuchs shows the pathlength differences in Figures 3 and 4 to be a significant difference and appears to be more than 1 mm.

5. With regards to **claim 24**, Leuchs shows method for measuring the wavelength of an input light beam in Figure 2, the method comprising:

launching the input light beam into a waveguide (2');

splitting the input light beam in the waveguide into two light beams;

directing the two light beams through two paths (3',4') and having two exit ports that are located in a plane normal to the direction of propagation of the central light rays exiting from said exit ports;

interfering light exiting said two paths to thereby form a fringe pattern at an observation plane;

detecting the fringe pattern (8a, 8b); and

analyzing the configuration of said detected fringe pattern.

Although the embodiment of Figure 2 appears to show that the physical path 4' is longer than path 3' since the exit end of path 4' is further away than the exit end of 3' from their respective entry ends, Leuchs does not clearly show or state that the first and second optical paths have a physical pathlength difference. However, if the pathlength of 4' is identical to 3',

one of ordinary skill in the art at the time of the invention would have made the physical pathlength of 4' to be different from 3' for the following reason:

Leuchs suggests that having a pathlength (phase) difference between the two is desired in order to make it easier to detect interference (column 3, lines 17 and 18), and Leuchs shows two examples how to achieve this as shown in Figures 3 and 4. Leuchs however does not show an example by making the physical length of one path longer of than the other path.

Kaufman et al (Kaufman hereinafter) show an interferometer where a phase between the beams in introduced by making the beams travel a different path length. The input and output ports are located in a common plane normal to the direction of propagation of the central light rays Furthermore, Official Notice is given that it is well known in interferometry to introduce a pathlength difference by making one path physically longer than the other. In the case where the interferometer is made from optical fibers or waveguides, bends are well known for providing longer optical pathlengths while the physical length from end to end is compact. In the case where the interferometer is made from bulk optics, it is well known to use mirrors to function similarly to optical fiber bends. In Kaufman's interferometer, one can observe that the size of the interferometer is dictated by the shortest light pipe 13 and not the longest.

Therefore, at the time of the invention, one of ordinary skill in the art would have modified the interferometer of Leuchs so that the physical pathlength of 4' is different from 3' in order to have a more compact interferometer as shown by Kaufman.

Leuchs also only shows two photodetectors and suggests more photodetectors (column 1, line 62) but does not expressly show a CCD and does not expressly state that the wavelength is calculate although suggesting the wavelength can be calculated.

Kachanov shows an interferometer for determining wavelength wherein the interferometer uses two point sources of light similar to Leuchs' fiber ends to create an interference pattern. Kachanov further shows CCD detector and a more complex processor than Leuchs' comparator by using a computer (140) to determine the wavelength.

At the time of the invention, one of ordinary skill in the art would have modified Leuchs with Kachanov's CCD detector and computer in order to obtain more information regarding the wavelength of the light since a CCD can obtain the full range of the interference fringes and the computer can do the perform the calculations automatically from the signals obtained by the CCD.

With regards to **claim 25**, obtaining the average of measurements is well known in order to obtain a more accurate measurement.

With regards to **claims 26-30**, Kachanov shows the determining of fringe position in column 11, and, obtaining the average of measurements is well known in order to obtain a more accurate measurement.

With regards to **claims 31 and 32**, both Leuchs and Kachanov shows temperature control. Also, Official Notice is taken that heat sinks and temperature controllers in thermal communication with optical device is well known in order cool or heat optical elements for control or stability and it would have been obvious to one of ordinary skill in the art to use a temperature controller with any element that generates heat such as the laser or computer to cool the laser or computer.

With regards to **claim 33,** Leuchs shows the waveguide is an optical fiber.

With regards to **claim 34**, Leuchs shows input light beam is split by means of an integrated optical circuit (Figure 2).

With regards to **claim 62**, Leuchs shows the pathlength differences in Figures 3 and 4 to be a significant difference and appears to be more than 1 mm.

6. **Claims 44-58** are rejected under 35 U.S.C. 103(a) as being unpatentable over Leuchs, Kaufman, and Kachanov as applied to claim 1 above, and further in view of Snyder (US 4,173,442).

With respect to **claim 44**, Leuchs, Kaufman, and Kachanov show all the elements but does not expressly show the process of determining the order number of the light to a reference point and the optical delay.

Snyder shows fringe analysis of determining the order number of the light to a reference point and the optical delay. At the time of the invention, one of ordinary skill in the art would have used the process of Snyder in order obtain a more accurate measurement of the wavelength.

With regards to **claim 45 and 49**, Leuchs shows in figures 2, 4, the system integrated on a substrate comprising a beamsplitter 18, a phase delay (figs. 3 and 4), and output ports 3a and 4a. Leuchs gives a few examples of the substrate material such as glass or lithium niobate, but does not expressly state that it is SiO_2 on a silicon substrate. Official Notice is taken that SiO_2 on a silicon substrate is well known and at the time of the invention, one of ordinary skill in the art would have used SiO_2 on a silicon substrate for its optical properties and thermal stability.

With regards to **claims 46-48**, both Leuchs and Kachanov shows temperature control. Also, Official Notice is taken that heat sinks and temperature controllers in thermal communication with optical device is well known in order cool or heat optical elements for control or stability and it would have been obvious to one of ordinary skill in the art to use a temperature controller with any element that generates heat such as the laser or computer to cool the laser or computer.

With regards to **claims 50-55, 57, and 58**, one of ordinary skill in the art would have optimized for the proper working range of knowing the relationship of the fringe spacing to the wavelength, pathlength difference, point source distance, and the distance to the observation plane as is known by the teaching of Young (Young disclosed by Applicant's disclosure).

With regards to **claim 56**, Leuchs shows a fiber optic coupler arrangement having output fibers which provide a prescribed optical phase delay (Fig 3).

With regards to **claim 64**, Leuchs shows the pathlength differences in Figures 3 and 4 to be a significant difference and appears to be more than 1 mm.

Allowable Subject Matter

Claims 20-23, 59, and 60 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: The prior art of record fails to show or to suggest an apparatus having all the elements as presently claimed wherein one or more arrays of optical fibers having input ends are configured to receive the fringe pattern.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Andrew Hwa S. Lee whose telephone number is 571-272-2419. The examiner can normally be reached on Tue-Fr.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory J. Toatley Jr. can be reached on 571-272-2800 ext 77. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Andrew Hwa Lee
Primary Examiner
Art Unit 2877